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Remarks on the Total Solar Eclipse of August 17th, 1868.

By Dr. Edmund Weiss.

Though Major Tennant has a few months ago* already drawn the attention to the total solar eclipse of 17th August, 1868, I beg leave to do so once more, as I have extended the computations to the whole track of the shadow, and wish to add a few remarks, which, I suppose, will increase highly the interest in that eclipse.

I have computed the central line and the limits of the totality by the formulæ given in the excellent paper by Hansen on the Theory of Solar Eclipses,† because I have found them by far the most convenient for these calculations. The track of the shadow during the eclipse is the following:

NORTHERN LIMIT.

	Local Apparent Time h m	Longitude E. ° ′	Latitude N+, S− ° ′
August 17	17 46·2	35 6·2	+ 11 53·1
	18 0	38 31·6	12 41·3
	18 40	47 55·7	14 42·3
	19 20	56 36·5	16 12·7
	20 0	64 38·4	17 11·0

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* *Monthly Notices*, vol. xxvii. p. 79 and 174.

† Hansen, *Theorie der Sonnenfinsternisse und verwandten Erscheinungen.* Leipzig, 1858.

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	Local Apparent Time.	Longitude E.	Latitude N +, S —
	h m	° ′	° ′
Aug. 17	20 40	72 5·0	17 36·8
	21 20	79 0·2	17 29·1
	22 0	85 27·7	16 48·2
	22 40	91 32·0	15 34·9
	23 20	97 17·8	13 50·0
	0 0	102 50·6	11 35·7
	0 40	108 18·6	8 55·0
	1 20	113 50·8	5 52·2
	2 0	119 37·4	+ 2 33·0
	2 40	125 49·3	− 0 55·4
	3 20	132 35·9	4 25·3
	4 0	140 5·0	7 49·1
	4 40	148 21·3	10 59·4
	5 20	157 26·3	13 49·9
	5 47·8	164 13·8	− 15 33·9

SOUTHERN LIMIT.

	Local Apparent Time	Longitude E.	Latitude N +, S —
	h m	° ′	° ′
August 17	17 48·1	35 37·8	+ 10 15·7
	18 0	38 34·6	10 55·8
	18 40	47 59·5	12 52·0
	19 20	56 40·3	14 17·9
	20 0	64 40·4	15 12·0
	20 40	72 4·0	15 33·6
	21 20	78 55·0	15 22·3
	22 0	85 17·5	14 38·2
	22 40	91 16·1	13 22·2
	23 20	96 56·4	11 35·4
	0 0	102 25·1	9 19·9
	0 40	107 50·5	6 39·0
	1 20	113 21·9	3 37·0
	2 0	119 10·1	+ 0 19·9
	2 40	125 25·3	− 3 5·4
	3 20	132 16·6	6 31·0
	4 0	139 50·9	9 49·5
	4 40	148 12·2	12 53·6
	5 20	157 21·8	15 37·8
	5 46·1	163 45·2	− 17 11·6

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CENTRAL LINE.

	Local Apparent Time.	Longitude E.	Latitude N +, S —	Duration of Totality.	Altit. of the centre of the Sun.	Excess of the Moon's Radius.
	h m	° ′	° ′	m s	° ′	″
Aug. 17	17 47·2	35 22·1	+ 11 4·4		0 0	
	18 0	38 33·2	11 48·7	3 8	2 54	55·0
	18 40	47 57·8	13 47·3	3 34	12 40	58·1
	19 20	56 38·7	15 15·5	4 3	22 26	61·0
	20 0	64 39·7	16 11·6	4 34	32 5	63·7
	20 40	72 4·7	16 35·2	5 7	41 40	66·1
	21 20	78 57·8	16 25·7	5 39	51 14	68·2
	22 0	85 22·8	15 43·4	6 8	60 51	69·9
	22 40	91 24·2	14 28·7	6 31	70 31	71·2
	23 20	97 7·1	12 42·9	6 45	80 15	71·9
	0 0	102 38·0	10 28·1	6 48	87 26	72·2
	0 40	108 4·5	7 47·1	6 39	78 52	71·8
	1 20	113 36·2	4 44·7	6 19	68 36	70·9
	2 0	119 23·6	+ 1 26·6	5 51	58 8	69·4
	2 40	125 37·0	— 2 0·6	5 19	47 34	67·3
	3 20	132 26·0	5 28·2	4 45	37 2	64·8
	4 0	139 57·7	8 49·1	4 12	26 35	62·0
	4 40	148 16·6	11 56·3	3 42	16 17	59·0
	5 20	157 23·8	14 43·8	3 15	6 15	55·9
	5 46·9	163 58·7	— 16 22·6		0 0	

The shadow touches the Earth near Gondar (Abyssinia), crosses the Straits of Bab-el-Mandel, including Perim, Mokha, and Aden; leaves Arabia by the Cape Râs-Furtak, and enters the Peninsula of India between Goa and Rajapoor. Its path across this country and the Malay Peninsula has been followed accurately by Major Tennant: I therefore omit it, and will only add, that the maximum of the duration of totality takes place in the Gulf of Siam where it reaches on the central line $6^m\ 50^s$, with an altitude of the Sun of $87\frac{1}{2}°$, and that the central line passes near Tenasserim, Mergui, and Po. Condore. On its further progress the shadow runs through Borneo (including Bruni), the Government Menado (Celebes), the Islands Bouru, Amboyna, Ceram, and the Arrou Archipelago; covers completely the southern part of New Guinea, and moves then towards the New Hebrides, where the totality begins at sunset.

At the commencement of the eclipse the Moon has just passed a perigee of uncommon proximity, and reaches during it the ascending node of her orbit. The eclipsed Sun rises therefore nearly to the zenith of those countries where the eclipse takes place at noon: hence the augmentation of the Moon's diameter, due to her altitude, is a maximum, and the velocity, with which the shadow hurries over the surface of

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the Earth, a minimum. The result of the coincidence of all these favourable conditions is an eclipse, which, as to its size, belongs to the largest that can happen in general, and has indeed in the annals of mankind no rival, since in the records of ancient eclipses there are to be found only two, which may be compared in size with that of August 17, 1868, but none in which the totality lasts so long. The first of these is the eclipse of Thales (28 May, 585 B.C.), which is said to have been the first predicted, and to have terminated a bloody war between the Lydians and the Medes. The second was visible on the 17 June, 1433, in Scotland, and the time of its occurrence was long remembered by the people of that country as "the black hour."

Besides its enormous size, the eclipse deserves in another respect special attention. In researches on the nature of the red prominences and other phenomena visible during total solar eclipses, it would certainly be of the highest importance to know something about the quality of the changes to which these appearances are subject. But, on a single place in the path of the shadow, the time of their visibility is too short to permit of the hope of perceiving in the meanwhile physical changes in them: this is, however, not quite improbable, if observations can be obtained on several places along the zone of the totality, which of course is only achievable when the shadow touches a series of accessible regions, affording the chance of fine weather. In the present eclipse this takes place in a very favourable manner. Soon after sunrise the totality commences on the Isle of Perim and in Aden; runs in the forenoon across India proper; reaches at noon Annam and Po. Condore; passes in the afternoon Borneo, Celebes, and many isles of the Molucca Archipelago, and finally becomes visible at New Guinea about sunset.

I think these remarks will suffice to show the importance which observations of this eclipse arranged systematically along the path of the shadow could attain, without mentioning peculiar questions, which, if at all, can be solved only by eclipses of this size. I also do not doubt, that persons enough could be found who would readily undergo the fatigues of the long journey and hot season, if the Indian Government could be induced to give aid for reaching several points in the eclipsed countries. At the instigation of Major Tennant, the Council doubtless have already taken pains to procure facilities for observers in India proper: I hope my remarks will cause the Council to ask for such also for the eastern, most important parts of the central line. At all events, a speedy publication of the accorded facilities is necessary, that this eclipse may not be lost only on account of the distance of the totally eclipsed regions, as probably centuries will pass before so favourable an occasion of extending our knowledge of solar physics will again occur.

Vienna, August 17, 1867.